

introduced by the amendment.

Applicant also respectfully submits that the above amendments and cancellation of claim 11 overcome the Examiner's rejection under 35 USC §112, first paragraph, presented at item 2 of the Office Action, and it is respectfully requested that such rejection be reconsidered and withdrawn.

Rejection Under 35 USC §112, Second Paragraph

At item 4 of the Office Action, the Examiner has rejected claims 2 and 11 under 35 USC §112, second paragraph, as being indefinite. In relation to claim 2, it is the Examiner's position that "... rutile structures may only belong to titanium dioxide."

Upon careful consideration and in light of the above cancellation of claim 11, applicant respectfully traverses such rejection, because (in fact) "rutile" structures do not only belong to titanium oxide as the Examiner has alleged. Tin oxide and other compounds besides titanium dioxide may indeed have a rutile structure, as discussed in the attachment A hereto (particularly pages 56, 58, 59 of the textbook **Modern Mineralogy** by Keith Frye). While titanium dioxide may be the most commonly recognized compound having a rutile structure, it is not the only such compound.

Based on the foregoing, the rejection of claims 2 and 11 under 35 USC §112, second paragraph, is believed to be overcome and accordingly it is respectfully requested that the rejection be reconsidered and withdrawn.

Rejection Based on Tada et al. (US Patent 6,379,776) and Komatsu et al. (US Patent 5,854,708)

The Examiner has rejected of claims 1-7 and 9-20 under 35 USC §103(a) as being unpatentable over Tada et al. (US Patent 6,379,776) in view of Komatsu et al. (US Patent 5,854,708), presented at item 6 of the Office Action. It is the Examiner's position that: Tada discloses most of the features of the claimed invention in relation to his nonfogging and stain proof glass articles, except that Tada's articles use titanium dioxide rather than tin oxide as a photocatalytic layer, his article is not disclosed as being a mirror, and he does not disclose the claimed thickness range for the SiO<sub>2</sub> overcoat layer; it would have been obvious to one having ordinary skill in the art at the time of the invention was made to use tin oxide as the photocatalyst layer of Tada because it

is functionally equivalent to  $\text{TiO}_2$  because both materials function as photocatalysts, as taught by Komatsu; it would have also been obvious to one having ordinary skill in the art at the time of the invention was made to apply Tada's teachings to a mirror based on the teachings of Komatsu; and while Tada does not disclose a specific thickness range for the  $\text{SiO}_2$  overcoat layer, the claimed thickness range would have been obvious as a matter of discovering an optimum value of a result effective variable using routine skill, and also based on the teaching of Komatsu regarding the thickness of his porous, hydrophilic overcoat layer.

#### Applicant's Response

Upon careful consideration and in light of the above amendment to claim 1, applicant respectfully traverses such rejection, and submits that claims 1-10 and 12-20 are clearly patentably distinct over the Tada and Komatsu references, based on the following.

Initially, applicant respectfully submits that the presently claimed invention is not disclosed or suggested by the applied references, and achieves a significant advantage which is not achieved or suggested by the applied references. Particularly, according to amended claim 1, an overcoat layer is formed on the surface of a tin oxide layer, and the overcoat layer is made from a material having an *opposite polarity* with respect to tin oxide from the aspect of surface polarity. According to the present invention, the combination of the tin oxide layer and the overcoat improves the surface properties of the tin oxide layer having preferable irregularities, and it becomes possible to obtain long-term stability of the hydrophilic properties.

From the viewpoint of only surface irregularities, it would seem that the tin oxide layer could achieve long term stability of the hydrophilic properties. However, since the surface of the tin oxide layer is electropositive, since the anionic soap easily adheres thereto. Specifically, the anionic soap adheres to the tin oxide layer with the negative portion (= the hydrophilic portion) of the anionic soap is attracted to the tin oxide layer, and the hydrophobic portion of the anionic soap is exposed on the surface. As a result of this, it is difficult to keep the stability of the

hydrophilic properties for a long period of time.

Thus according to the present invention, by forming the overcoat layer which of a material having an opposite polarity with respect to tin oxide from the aspect of surface polarity, on the surface of the tin oxide layer, it becomes possible to obtain greater, long-term stability of the hydrophilic properties. Such aspect of the invention is not achieved or suggested by Tada, who applies a silicon oxide monocomponent equivalent layer or similar layer over  $\text{TiO}_2$  to prevent organic substances from being adhered to the  $\text{TiO}_2$  layer because the silicon oxide monocomponent equivalent layer or similar layer "... are nonpolar or has low polarity...." Similarly, this aspect of the invention is not achieved or suggested by Komatsu, who applies a porous covering layer (i.e., a porous,  $150\text{\AA}$  layer of  $\text{SiO}_2$ ) over a transparent photocatalytic layer such that the pores function as capillaries to improve the wetting property of an object's surface.

The above amendment to claim 1 emphasizes this important aspect of the invention.

Relatedly, applicant respectfully submits that persons of ordinary skill in the art would not consider it obvious to hypothetically modify Tada's antifogging articles by replacing the  $\text{TiO}_2$  photocatalytic layer with a layer of  $\text{SnO}_2$  based on the teachings of Komatsu, as proposed by the Examiner because  $\text{SnO}_2$  is recognized as having inferior photocatalytic properties to  $\text{TiO}_2$ , and because the porous nature of Komatsu's covering layer is contrary to Tada's silicon oxide monocomponent equivalent layer in that Tada teaches against an arithmetical mean roughness ( $R_a$ ) exceeding 80 nm.

Still further, applicant respectfully submits that even if the Tada and Komatsu references were hypothetically combined, any combination resulting from the full, fair teachings of these references would not achieve or make obvious several important features of the claimed invention. Again, neither of the references teaches or suggests the feature of amended claim 1 defining that the overcoat layer has a surface polarity opposite to that of tin oxide.

Further, there is no suggestion or teaching in any of the references that it would be obvious to modify Tada's invention to include a tin oxide layer having a *rutile structure* as defined in claim 2,

whereas such feature provides an unobvious advantage, i.e., such structure makes it possible to easily form a polycrystalline film having a surface of preferable irregularities. In this regard, it will be noted that rutile titanium dioxide is recognized as having *inferior* photocatalytic properties in comparison to anatase titanium dioxide.

Still further, the applied references do not make obvious the claimed thickness of a tin oxide layer defined in claims 5 and 17-19, or the related claimed thickness of the overcoat layer defined in claims 6 and 20. In this regard, it is noted that the claimed layer thicknesses are unobviously advantageous, e.g., an excessive thickness of the tin oxide layer is not only an inefficient use of material, but would result in insufficient hydrophilic properties as discussed at page 12, lines 8-11. Moreover, it is noted that Tada and Komatsu specifically discuss features of a titanium dioxide photocatalyst layer, not tin oxide, whereas the characteristics of these titanium dioxide as a photocatalyst (as is necessary in all examples of both Tada and Komatsu) is recognized as different/superior to that of tin oxide, such that the thickness of a  $\text{TiO}_2$  layer has no direct/specific correlation to a  $\text{SnO}_2$  layer. Similarly, the porous nature, and related thickness, of Komatsu's covering layer is contrary to the thickness and surface roughness of the claimed overcoat layer, as discussed above. Hence, applicant respectfully submits that the claimed thicknesses are not obvious matters of routine experimentation, contrary to the Examiner's allegation.

Additionally, applicant respectfully submits that the applied references do not disclose the feature of claim 7 regarding the refractive indexes of the undercoat film, the substrate and the tin oxide layer, whereas this feature is particularly advantageous for purposes of improved transparency - appearance, as discussed at page 8 of the present specification. It is noted that the Examiner does not specifically address this feature.

Based on the foregoing, applicant respectfully submits that the rejection of claims 1-7 and 9-20 under 35 USC §103(a) based on the Tada et al. and Komatsu et al. references is overcome, and accordingly it is respectfully requested that such rejection be reconsidered and withdrawn.

Rejection Based on Tada et al., Komatsu et al. and Ando et al. (US Patent 5,605,609)

The Examiner has also rejected claim 8 under 35 USC §103(a) as being unpatentable over the Tada and Komatsu references as applied above and further in view of Ando et al. (US Patent

5,605,609), presented at item 7 of the Office Action. It is the Examiner's position that it would have been obvious to a person of ordinary skill in the art at the time of the invention to further modify Tada's nonfogging articles to include an alkali barrier film including silicon and tin based on the teachings of Ando.

#### Applicant's Response

Upon careful consideration applicant respectfully traverses such rejection, and submits that claim 8 is clearly patentably distinct over the applied references, based on the foregoing arguments regarding the deficiencies of Tada and Komatsu as discussed above relative to claims 1-7 and 9-20, which are not overcome by any additional teaching of Ando.

In view of the foregoing, applicant respectfully submits that the rejection of claim 8 under 35 USC §103(s) is overcome, and accordingly it is respectfully requested that such rejection be reconsidered and withdrawn.

#### Conclusion

In conclusion, applicant has overcome the Examiner's objections and rejections set forth in the Office Action, and moreover, applicant respectfully submits that the application is now in condition for allowance, and a notice to that effect is earnestly solicited.

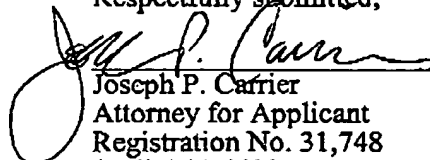
If the Examiner is not fully convinced of the patentability of the presently claimed invention in light of the above arguments, applicant respectfully requests that the Examiner telephonically applicant's undersigned representative to discuss the Examiner's concerns, in an effort to expedite prosecution of the application.

A Petition for One-Month Extension is being filed concurrently herewith.

Favorable consideration is respectfully requested.

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October 22, 2002

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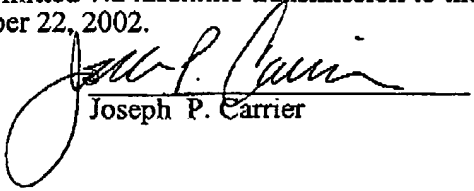
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I hereby certify that this correspondence is being submitted via facsimile transmission to the US Patent & Trademark Office, Art Unit 1775, on October 22, 2002.

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Joseph P. Carrier



Marked - Up copy of Amended Claims 1 and 13

1. (twice amended) A hydrophilic member comprising:

a tin oxide layer formed on a surface of a substrate; and

an overcoat layer formed on the surface of said tin oxide layer, wherein said overcoat layer has a surface polarity opposite to that of tin oxide, is selected from at least one of silicon oxide, aluminum oxide, zirconium oxide, ceric oxide, and titanium oxide, and the mean surface roughness ( $R_a$ ) of the top surface thereof is within a range of 0.5 to 25 nm.

13. (amended) A hydrophilic member according to claim 12, wherein said hydrophilic member is a mirror having a thin metal film formed on the surface thereof[, between the undercoat film and the tin oxide layer].

Clean copy of Amended Claims 1 and 13

Sub  
C1  
B1  
B2

1. (twice amended) A hydrophilic member comprising:

a tin oxide layer formed on a surface of a substrate; and

an overcoat layer formed on the surface of said tin oxide layer, wherein said overcoat layer has a surface polarity opposite to that of tin oxide, is selected from at least one of silicon oxide, aluminum oxide, zirconium oxide, ceric oxide, and titanium oxide, and the mean surface roughness ( $R_a$ ) of the top surface thereof is within a range of 0.5 to 25 nm.

13. (amended) A hydrophilic member according to claim 12, wherein said hydrophilic member is a mirror having a thin metal film formed on the surface thereof.



EXHIBIT

A

*Library of Congress Cataloging in Publication Data*Frye, Keith.  
Modern mineralogy.

## Bibliography:

1. Mineralogy. I. Title.  
QE363.2.F79 1974 549 73-4962  
ISBN 0-13-595686-2

KN1-1S2.A

Re. p. 2 (last #)  
of OA dated  
28 Jun 2002

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Printed in the United States of America

PRENTICE-HALL INTERNATIONAL, INC., London  
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PRENTICE-HALL OF CANADA, LTD., Toronto  
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Prefac

1 Princip

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oxides and sulfides of alkali-earth elements, with the exception of Be; some oxides of divalent transition metals; and galena [PbS].

The CsCl structure is simple cubic (Fig. 2-3). The  $\text{Cl}^-$  ions occupy the corners of the cubic primitive cell and the  $\text{Cs}^+$  ion occupies the center. There

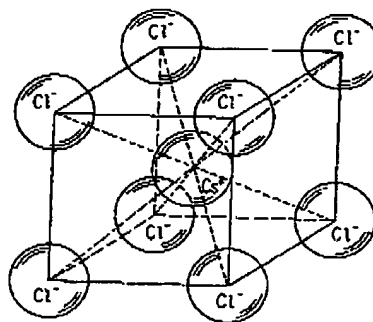


Figure 2-3 CsCl structure. This structure is made up of two interpenetrating PC lattices. The unit cell of CsCl may be shown with either  $\text{Cs}^+$  or  $\text{Cl}^-$  in the PC positions. All ions are in cubic coordination.

are, thus, one  $\text{Cs}^+$  ion and one  $\text{Cl}^-$  ion per unit cell. Again, it is immaterial whether the  $\text{Cl}^-$  or the  $\text{Cs}^+$  ion occupies the corner position, as the structure is made up of two interpenetrating simple cubic arrays.

Each  $\text{Cs}^+$  ion is surrounded by eight  $\text{Cl}^-$  ions and each  $\text{Cl}^-$  ion by eight  $\text{Cs}^+$  ions. As has already been explained, pressure tends to increase cation coordination numbers. Under very high pressure, 18,000 bars for halite itself, minerals with halite structure invert to the CsCl structure.

At this point in the discussion, a slight digression on the subject of terminology is warranted. Halite is a mineral with the specific composition NaCl. It has the structure illustrated in Fig. 2-2. All minerals and crystalline compounds having this structure are said to have *halite structure*, regardless of their chemical composition. All structures are named for their chief example. Whether or not it is wise to have two related but different meanings for a mineral name is a question which belongs more properly to philosophy than to mineralogy. Let it suffice to note that the two meanings for the same word exist side by side in modern mineralogic usage, and that the meaning should be clear from the context.

The two preceding crystal structures had chemical bonds that were primarily ionic in character. The remaining two AX structure examples have

The wurtzite structure has anions in an HCP array with the cations occupying one half the tetrahedral voids.

### 2-3. $AX_2$ Structures

The three important mineral structures that have a cation-to-anion ratio which can be expressed as  $AX_2$  are fluorite [ $CaF_2$ ], rutile [ $TiO_2$ ], and quartz [ $SiO_2$ ]. The cation CN's are VIII, VI, and IV, respectively, reflecting a decrease in cation size. The fluorite structure is based on a FCC array of  $Ca^{2+}$  ions, which yields a unit cell of four cations. The anions occur along the body diagonals of the unit-cell cube, and, as can be seen in Fig. 2-5, there are eight

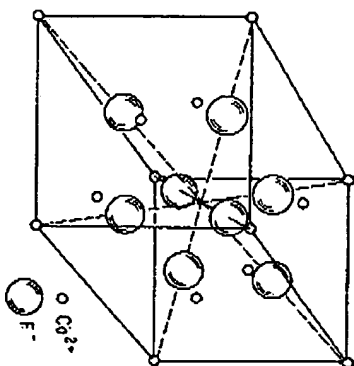


Figure 2-5 Fluorite structure. The  $Ca^{2+}$  ions occupy the cube corners and the centers of the faces. The  $F^-$  ions occur along the body diagonals of the cube. Each  $Ca^{2+}$  ion is in eightfold coordination and each  $F^-$  ion in fourfold coordination.

of them, all interior to the unit-cell cube. Each cation coordinates eight anions, and each anion coordinates four cations. It is worth noting, at this point, that the octahedral cleavage of fluorite follows planes composed of  $Ca^{2+}$  ions in a closest-packed layer (Section 4-4). The minerals thorianite [ $ThO_2$ ] and cerianite [ $CeO_2$ ] have the fluorite structure.

The rutile structure (Fig. 2-6) can be described as having cations in a distorted BCC array, for a total of two cations per unit cell. Four anions lie in pairs on two opposite faces, and two are interior to the unit cell, making a total of four anions per unit cell. This maintains the  $AX_2$  ratio. Cassiterite [ $SnO_2$ ], polianite [ $MnO_2$ ], stishovite [ $SiO_2$ ] and rutile [ $TiO_2$ ] have this structure.

The quartz structure is based on the all-important silica tetrahedron. Each cation is surrounded by four anions and each anion is bonded to two cations. That is, the coordination polyhedra share corners. The subject of

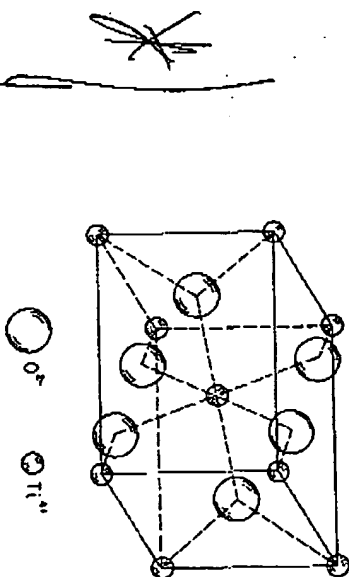


Figure 2-6 Rutile structure. The unit cell is square in outline as viewed from the top, but the dimension shown vertically in the drawing is shorter than the side of the square. The  $Ti^{4+}$  ions are at the corners and the center of the unit cell. The  $O^{2-}$  ions are on two of the faces plus two in the interior of the unit cell. Each  $Ti^{4+}$  ion is surrounded by six  $O^{2-}$  ions in a distorted octahedron. These octahedra share edges between adjacent unit cells, causing the shortening of the shared elements of the coordination polyhedra (Section 1-12). Each  $O^{2-}$  is in threefold coordination.

silica structures is of such importance mineralogically that it is covered in a separate section (Section 2-12).

### 2-4. $A_2X_3$ Structures

There are a large number of  $A_2X_3$  structures, but the most common one among the natural minerals is the corundum structure. The corundum structure (Fig. 2-7) is based on hexagonal close packing of  $O^{2-}$  ions, with  $Al^{3+}$  ions occupying two thirds of the available octahedral voids. The  $Al^{3+}$  ions are not randomly distributed, but are in a very ordered array. Because one third of the octahedral voids are vacant, the  $O^{2-}$  ions are distorted slightly from perfect HCP.

Hematite has the corundum structure with  $Fe^{3+}$  in place of  $Al^{3+}$ . The sesquioxides of  $Cr^{3+}$  and  $V^{3+}$  also have the corundum structure.